

PATENT SPECIFICATION

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(54) SUCTION GRIPS

(71) We, CARL FREUDENBERG, a German Company (a Kommanditgesellschaft, the present personally responsible partners of which are, HELMUT FABRICIUS, HANS ERICH FREUDENBERG, OTTO SCHILDHAUER, HERMANN FREUDENBERG, DIETER FREUDENBERG, and REINHART FREUDENBURG), of 6940 Weinheim Bergstrasse, Höhrerweg 2, West Germany, do hereby declare the invention, for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to suction grips made of an elastomeric material, and consisting of a mounting stem and a suction cup at one end of the stem.

Similar suction grips are known from the art of conveyors. They are usually installed as gripping tools and can have various sizes and forms, according to the particular duties.

It is known to control the sucking and release of suction grips with the help of mechanical devices or by special pneumatic valves. The last-mentioned kind of control is generally employed if rapid and exact control of a plurality of suction grips is involved.

Such a solution is however not satisfactory, to the extent that the necessary pneumatic installation is associated with significant costs. A vacuum pump is necessary in particular, besides various control valves. Since, in contrast to the compressed air network available in the majority of factories, in general no central vacuum network is available, this requirement is generally associated with the independent provision of a vacuum pump. However, technical difficulties then also arise, in particular because dirt or dust can penetrate into the system through these suction cups when they are sucking, and can lead to disturbances there. Employment is therefore limited to a dust-free atmosphere.

The object underlying the invention is to develop suction grips which enable a reliable and exact operation without requiring an external vacuum source.

This object is solved according to the invention by a suction grip made of an elastomer, and consisting of a mounting stem containing a cavity, a suction cup at one end of the stem, the internal space of the cup communicating with the cavity through a flexible valve which is directly at the base of the suction cup and which remains tightly closed when there is vacuum in the suction cup and atmospheric pressure in the cavity, but permits passage of compressed air from the cavity into the internal space of the suction cup.

According to two possible embodiments of the invention, the valve is constituted by a ball or a cylindrical member which is arranged in the cavity.

According to another embodiment, the valve has a lip seal, which is integral with the rest of the suction grip.

Three examples of embodiments of the invention are shown in the accompanying drawings, and will be described in more detail below.

Each of the Figures is a vertical cross section of a respective suction grip.

Each of the suction grips is made of an elastomeric material, for example of rubber, and comprises a mounting stem 1 and a suction cup 2. Each of the grips is suitably manufactured integrally by injection or other moulding. Under special requirements, for example if large suction cups rapidly wear out by the continuous picking up of bodies with highly abrasive surfaces, the suction cup may be releasably secured on the mounting stem.

The significant feature of the suction grips is to be seen in a valve 4.1, 4.2, 4.3, which is arranged between a cavity 3 and an internal space 5 of the suction cup. The valve lies directly at the base of the suction cup 2. If this cup is pressed firmly against a flat object while there is atmospheric pressure in the cavity 3, then the consequence is that air in the space 5 is almost entirely expelled, between the peripheral edge of the cup and the object, as would be the case with a cup having no communication with its internal space. Then, upon lifting of the suction grip, a partial vacuum

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arises in the internal space, so that a very good holding force is produced on the object. If thereafter the object which has been picked up is to be put down, then provision is made to direct a short blast of compressed air through the cavity 3 of the mounting stem to the valve. This is constructed so that it is thoroughly vacuum tight, that is to say it will not leak at all with a positive pressure difference of up to 1 atmosphere between the cavity 3 and the space 5, but so that it opens with the excess pressure of 2 to 6 atmospheres usually present in a compressed air network. For example, the opening takes place in constructions according to Figures 2 and 3 in that the mounting stem 1 elastically enlarges in the neighbourhood of the ball or cylindrical member, so that the compressed air can reach the internal space of the suction cup 5.

The vacuum in the internal space of the suction cup 5 is thereby filled, and an immediate release follows of the object which has been picked up.

Figure 1 shows a suction grip in which the valve is constituted by a lip seal.

Figure 2 shows another grip, in which the valve 4.2 is constituted by a ball valve.

Figure 3 shows a grip resembling Figure 2, in which however a cylindrical member is employed instead of the ball. All materials with relatively high surface hardness are suitable as materials for forming the ball, for example wood, plastics, metal or ceramic materials. All embodiments are suitable for employment under conditions of continuous operation, and good results have been achieved in this respect.

The advantages which can be obtained with a suction grip according to the invention consist especially in that, with omission of the vacuum pump hitherto necessary, it makes possible an especially exact and reliable picking up and putting down of the objects being transported. In practical operation it appears to be thoroughly insensitive to dirt. In addition it is advantageous that the wide possibil-

ities of shape of special suction cups are not prevented by the valve arrangement according to the invention.

An additional advantage consists in the possibility, introduced by the employment of a suction grip according to the invention, of also being able to pick up objects covered in dust. For this purpose it is only necessary to introduce a short blast of compressed air through the valve 4.1, 4.2, 4.3, before and/or during the application to the contact surface, so as to remove the dust from the sealing zone of the suction cup.

WHAT WE CLAIM IS:—

1. A suction grip made of an elastomer, and consisting of a mounting stem containing a cavity, a suction cup at one end of the stem, the internal space of the cup communicating with the cavity through a flexible valve which is directly at the base of the suction cup and which remains tightly closed when there is vacuum in the suction cup and atmospheric pressure in the cavity, but permits passage of compressed air from the cavity into the internal space of the suction cup.

2. A suction grip according to claim 1, in which the valve is constituted by a ball or a cylindrical member which is arranged in the cavity, and has a diameter greater than the diameter of the cavity.

3. A suction grip according to claim 1, in which the valve has a lip seal, which is integral with the rest of the suction grip.

4. A suction grip according to claim 1, substantially as described with reference to Figure 1, Figure 2, or Figure 3 of the accompanying drawings.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*

FIG.1

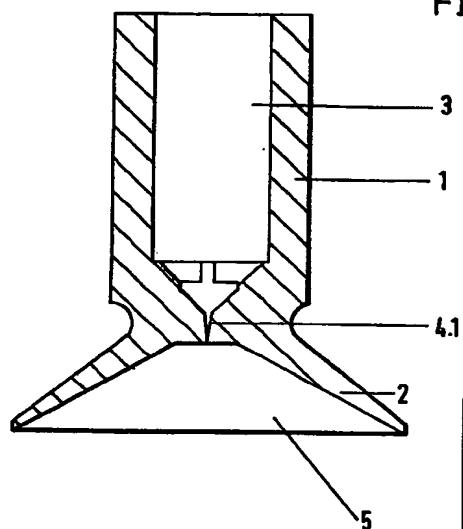


FIG.2

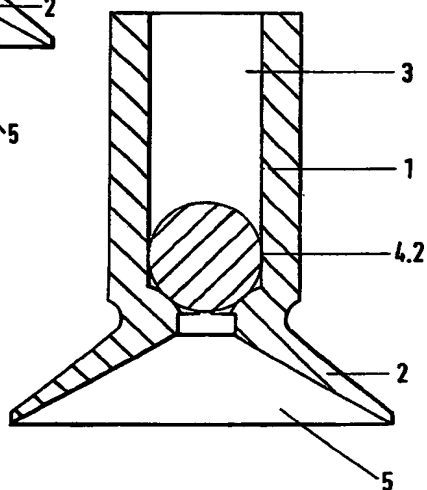
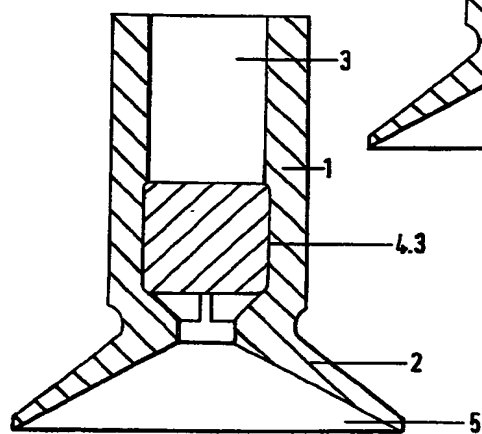


FIG.3



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